

# UNCLASSIFIED

AD NUMBER
ADB323013
NEW LIMITATION CHANGE
TO Approved for public release, distribution unlimited
FROM Distribution authorized to DoD only; Specific Authority; SEP 2006. Other requests shall be referred to Modeling and Analysis, ATTN: N144, Navy Department, Washington, DC 20350.
AUTHORITY
CNA ltr dtd, Sep 2006

THIS PAGE IS UNCLASSIFIED

# **Billet Analysis Tool (BAT)**

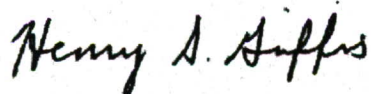
Steven W. Belcher • Peter H. Stoloff  
Kletus S. Lawler



4825 Mark Center Drive • Alexandria, Virginia 22311-1850

Approved for distribution:

September 2006

A handwritten signature in black ink, reading "Henry S. Griffis". The signature is written in a cursive style with a large, stylized 'H' and 'G'.

Henry S. Griffis, Director  
Workforce, Education and Training Team  
Resource Analysis Division

CNA's annotated briefings are either condensed presentations of the results of formal CNA studies that have been further documented elsewhere or stand-alone presentations of research reviewed and endorsed by CNA. These briefings represent the best opinion of CNA at the time of issue. They do not necessarily represent the opinion of the Department of the Navy.

Distribution limited to DOD agencies. Specific authority: N00014-05-D-0500.  
Copies of this document can be obtained from the Defense Technical Information Center at [www.dtic.mil](http://www.dtic.mil) or from the CNA Document Control and Distribution Section by calling (703) 824-2123.

Copyright © 2006 The CNA Corporation

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY) 09/2006		2. REPORT TYPE Final		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE  Billet Analysis Tool (BAT)				5a. CONTRACT NUMBER N00014-05-D-0500	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER 0605154N	
6. AUTHOR(S) Belcher, Steven, W. Stoloff, Peter, H. Lawler, Kletus, S.				5d. PROJECT NUMBER R0148	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Center for Naval Analyses 4825 Mark Center Drive Alexandria, VA 22311-1850				8. PERFORMING ORGANIZATION REPORT NUMBER  D0014545.A2	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Head Modeling and Analysis (N144) Navy Department Washington DC 20350				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution limited to DoD agencies.					
<div style="display: flex; justify-content: space-between;"> <div> <p><b>DISTRIBUTION STATEMENT E:</b></p> <p>Distribution authorized to DoD Components only.</p> <p>Other requests shall be referred to:</p> </div> <div> <p>Specific Authority,</p> <p><i>Sep 2006</i></p> </div> </div>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT In building POM programs to meet future mission requirements, Navy force planners evaluate numerous force structure alternatives. Two key considerations in evaluating these alternatives are manpower requirements and costs. The Director of Total Force Programming and Manpower (N12) is responsible for determining the manpower requirements and costs of each alternative. Doing this using the current manpower database systems and tools, however, is a laborious, time-intensive process. To better support manpower planning and programming efforts, N12 needs an analytical tool that can quickly determine the manpower implications of force structure changes. To meet this need, CNA developed the Billet Analysis Tool (BAT). BAT is a Microsoft Access application that uses data from the Navy's Total Force Manpower Management System (TFMMS) to determine the manpower implications of changes to the Navy's force structure, shore/support infrastructure, and manning level policies. It calculates, for a user-defined scenario, the change in billet requirements and authorizations for each component of the total force: active duty, full-time support (FTS), Selected Reserve (SELRES), and government civilians. Results can be aggregated and displayed at various levels of detail down to the rating/designator and paygrade levels. The tool also calculates manpower costs using both programming and composite cost rates.					
15. SUBJECT TERMS TFMMS, Manpower Requirements, Billet Authorizations, Manpower Costs, Force Structure					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT U	b. ABSTRACT U	c. THIS PAGE U			Knowledge Center/Rhea Stone
			SAR	26	19b. TELEPHONE NUMBER (include area code) 703-824-2110

## Outline



- Background and tasking
- Tool design
  - Defining the scenario
  - Calculating manpower requirements and costs
  - Displaying output
  - Other features
- Data sources
- Tool utility and the road ahead

This annotated briefing describes the Billet Analysis Tool (BAT), which CNA developed for the Director of Total Force Programming and Manpower (N12). This tool uses data from the Navy's Total Force Manpower Management System (TFMMS) to determine the manpower implications of changes to the Navy's force structure, shore/support infrastructure, and manning level policies. It gives N12 the ability to quickly analyze the manpower aspects of force structure alternatives that are developed and evaluated during the POM process.

This document comprises four sections. The first gives background information on what prompted the study effort and describes CNA's tasking. The next section explores how the tool works, beginning with defining a scenario, then calculating manpower requirements and costs, and finally displaying results. The third section reviews the data sources and describes the processes we used to integrate these data into the tool. The last section presents some examples of the tool's utility and outlines what lies ahead.

## Background

In developing programs to meet future mission requirements, force planners evaluate numerous force structure alternatives:

- N12 is responsible for determining the Navy manpower implications (billet requirements and costs)
- With current databases and tools, it is a laborious, time-intensive process
- N12 needs an analytical tool that can quickly determine the manpower implications of force structure changes
- N14 identified CNA's Force Structure to Enlisted Training (FSET) model as a candidate
- FSET is outdated, but underlying methodology can still serve as a framework

In building Program Objective Memorandum (POM) programs to meet future mission requirements, Navy force planners develop, evaluate, and compare numerous force structure alternatives. Two key considerations in evaluating and comparing these alternatives are manpower requirements and their associated costs. The Director of Total Force Programming and Manpower (N12) is responsible for determining the manpower requirements and costs of each alternative. Doing this using the current manpower database systems and tools available to N12 analysts, however, is a laborious, time-intensive process that involves sifting through lengthy paper reports and manually identifying billets associated with each force structure unit. To better support manpower planning, programming, and budgeting efforts, N12 needs an analytical tool that can quickly determine the manpower implications of force structure changes. In searching for such a tool, N1's Modeling & Analysis Division (N144) identified CNA's Force Structure to Enlisted Training (FSET) model as a possible candidate. FSET, which was developed in 1995 for the training community, computes manning requirements and associated training loads for a user-defined force structure and shore/support infrastructure. Although FSET's programming is outdated, N144 felt that its underlying methodology could serve as a framework for developing a new tool to address N12's needs. Consequently, N144 asked CNA to develop a computer-based tool that would determine the manpower implications of force structure changes and assist N12 in the POM process.

## Tasking

### **Build a computer-based tool with the ability to:**

- Determine manpower implications of changes to
  - Force structure
  - Shore infrastructure
  - Manning policy
- Include total force requirements
  - Active duty
  - Reserves (FTS and SELRES)
  - Government civilian
- Display output by
  - Rating/designator and paygrade
  - Enterprise
  - IGCA groupings
- Compute manpower costs
- Accept manning requirements for future platforms

Through discussions with our sponsor, N144, and N12 manpower analysts, we identified a set of capabilities that this computer-based tool should provide. Foremost was the capability to quickly determine manpower implications of changes to the force structure. That is, if the Navy were to change the force structure by adding or deleting ships, submarines, and aviation squadrons, how would manpower requirements change? In addition, because the manpower effects of force structure changes could extend into areas of the shore infrastructure, the tool should provide the capability to examine manpower requirements at shore-based activities. Another desired feature related to force structure change was the ability to assess the impact of manning level decisions. For example, how would manpower requirements change if the Navy changed its manning level policy for operating forces from 100 percent of billets authorized to 90 percent?

The sponsor requested that the tool address all components of the total force: active duty, full-time support (FTS), Selected Reserve (SELRES), and government civilians. Due to the lack of quality data, we agreed not to include contractor requirements at this time. The TFMMS would serve as the source for all manpower requirements (both billet requirements and billet authorizations). The sponsor wanted the ability to group and display manpower results at various levels of detail, from summary reports at the manpower appropriation category level (i.e., MPN, RPN, and civilian) to detailed reports at the rating/designator and paygrade levels. After testing an early version of the tool, the sponsor asked us to include additional data fields so that output results could be grouped by Enterprise and Inherently Government Commercial Activity (IGCA) categories.

In addition to determining manpower requirements (in terms of billets), the sponsor requested that the tool calculate the costs of these requirements. Because N1's POM-08 guidance called for manpower costs based on both "programming" and "composite" cost rates, the sponsor asked that the tool calculate these costs using both rates. Finally, to support planning beyond the Future Years Defense Plan (FYDP), N12 analysts asked us to provide a capability to incorporate manpower requirement data for future platforms that are not in TFMMS (e.g., the new DDX class destroyer).

## Billet Analysis Tool (BAT)

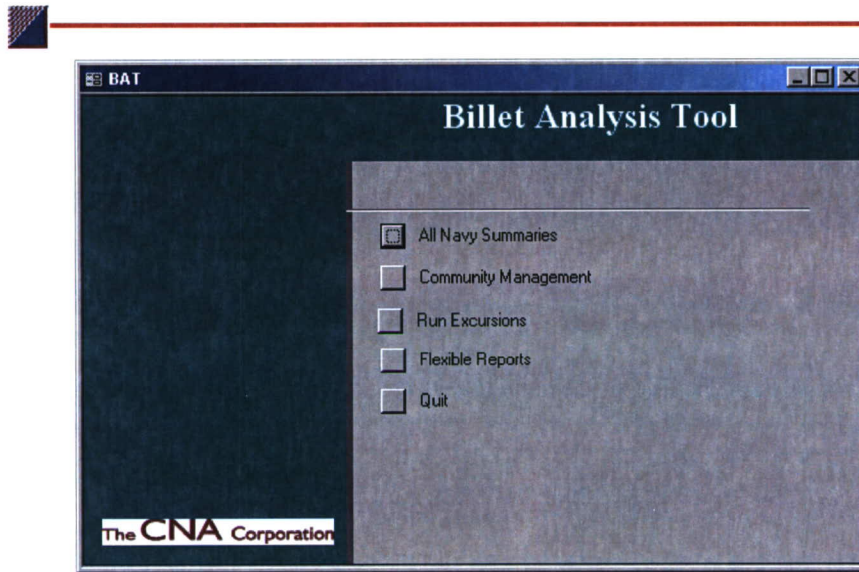
- Microsoft Access application – Navy/ Marine Corps Intranet (NMCI) compliant
- Enables manpower analysts to quickly analyze, manipulate, and review manpower requirements data
- Design based on data structure in TFMMS



To meet the requirements set forth by the sponsor and N12 analysts, CNA developed the Billet Analysis Tool (BAT). BAT is a *Microsoft Access* application that allows manpower analysts to quickly analyze, manipulate, and review manpower requirements data in TFMMS. Manpower results can be aggregated and displayed at various levels of detail down to the rating/designator and paygrade levels. BAT also calculates the cost of manpower requirements using both programming and composite manpower cost rates.

We designed this tool based on the data structure in TFMMS. TFMMS defines military and civilian manpower requirements by billets and organizes these billets by activity. BAT allows users to define scenarios in terms of activities; it then uses the link between billets and activities to extract manpower requirements for these activities and add up the requirements.

# BAT Modules

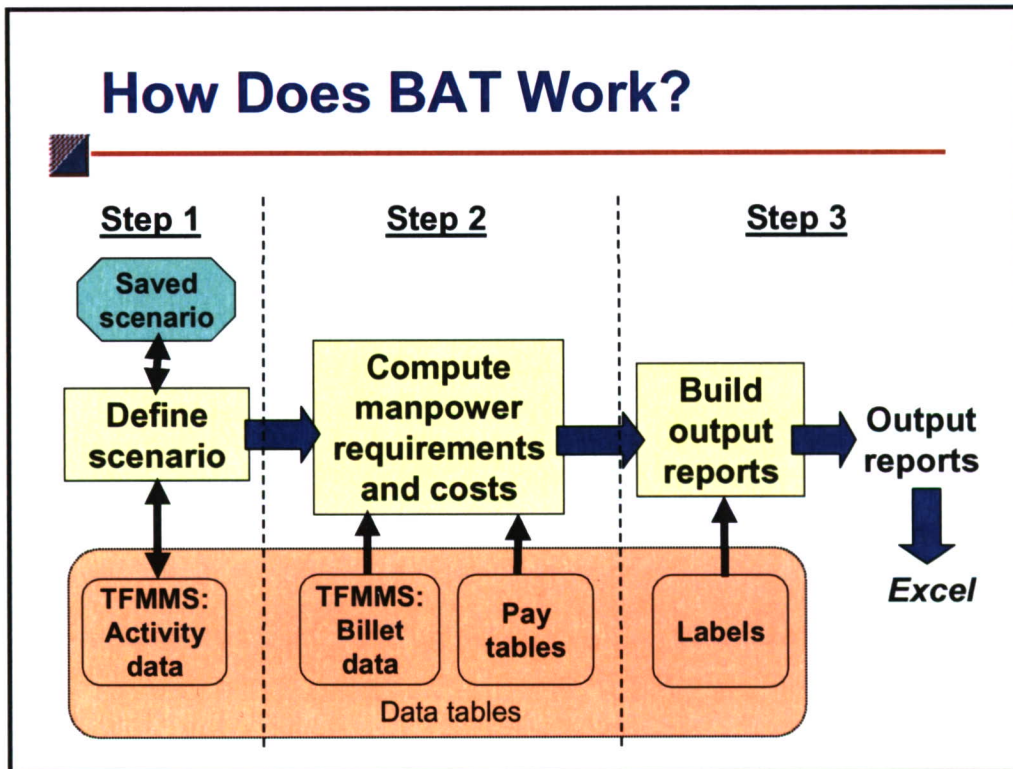


The Billet Analysis Tool consists of four modules that are accessed through the tool's main screen, as shown on the slide. These modules are:

- ***All Navy Summaries:*** This module provides a quick way to display manpower requirements and costs for the entire Navy as programmed in TFMMS. It gives the user the option to include or exclude manpower requirements for future platforms (which are not in TFMMS).
- ***Community Management:*** This module provides the capability to quickly display Navy manpower requirements for individual enlisted ratings and Navy Enlisted Classifications (NECs) and for officer designators.
- ***Run Excursions:*** This is the main module in BAT. It is where the user defines scenarios (in terms of operating units and shore activities) and computes manpower requirements and costs for these scenarios. It provides features to facilitate scenario building, to tailor output, and to select reports.
- ***Flexible Reports:*** This module allows the user to build custom reports to display results. The user specifies which output measures to display and how to group (or aggregate) these results.

The next several slides describe how this tool and, in particular, the *Run Excursion* module work.

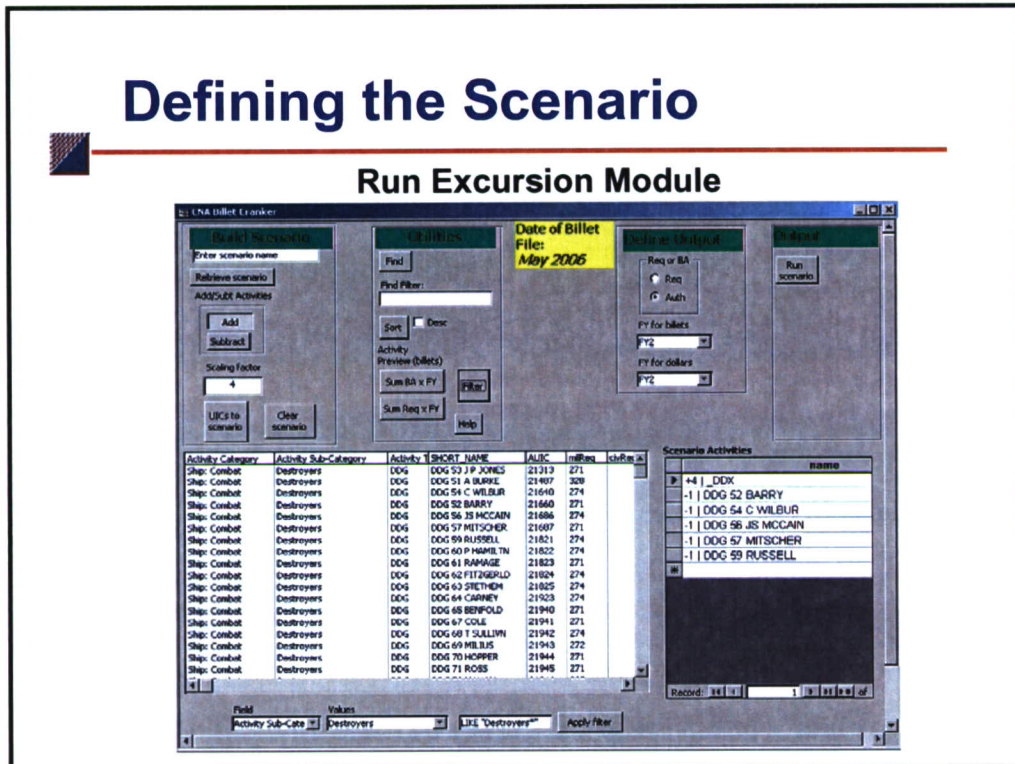
## How Does BAT Work?



Using the *Run Excursions* module in BAT to compute the effects of force structure changes on manpower requirements involves three steps. First, the user defines a scenario by selecting one or more operating force units and shore activities from a listing of all Navy activities. (The scenario can be saved and recalled for later use.) Second, using military and civilian manpower data extracted from TFMMS, along with military and civilian pay tables, the tool calculates the manpower requirements and costs for the scenario. Third, the user selects one of the “canned” output reports or uses the report generator to construct a custom output report. Options include both formatted reports and data sheet (spreadsheet format) output. The latter can easily be copied and pasted into a Microsoft Excel spreadsheet for further analysis and display.

# Defining the Scenario

## Run Excursion Module



This slide shows the *Run Excursions* interface through which the user defines a scenario by selecting activities from the activity list (bottom left window) for the scenario activities list (bottom right window). An activity can be an addition (+1) or a deletion (-1). A scenario can be all additions, all deletions, or a combination. For example, determining the manpower implications of replacing 5 DDG ships with 4 DDX ships would involve a scenario with -5 DDGs and +4 DDXs. The tool computes the net manpower requirement, which could be positive or negative. An activity's manpower requirements can be reduced or increased by specifying a scaling factor when selecting the activity. A number from 0 to 1 will reduce the manning requirements at an activity; a number greater than 1 will increase the requirements. For example, to compute the effects of manning an activity to 80 percent of requirements or authorizations, the user would enter a scaling factor of 0.8. To define a scenario that involves multiples of the same units (e.g., 4 DDX ships), the user would enter an integer scaling factor equal to the number of units (in our example, 4, for the DDX UIC).

To help the user identify activities when defining a scenario, we included several data fields (in the activity list window) that provide amplifying information about each activity. These include activity category/subcategory/type (see next two slides for a description), location (city, state, and geolocation code), claimant, duty type (sea, shore), and activity code (shows relationships between parent and subordinate activities).

The user can narrow the listing by filtering on any data field (column) in this window. Simply click the filter button and the filter window appears below the activity window. Select the field (from a pull-down menu) and the value for that field (from a separate pull-down menu), and click the "Apply Filter" button. The tool can sort the activity listing by any field and also has a search feature that allows the user to quickly find an activity of interest (e.g., if the name or UIC is known).

## Categorizing Activities

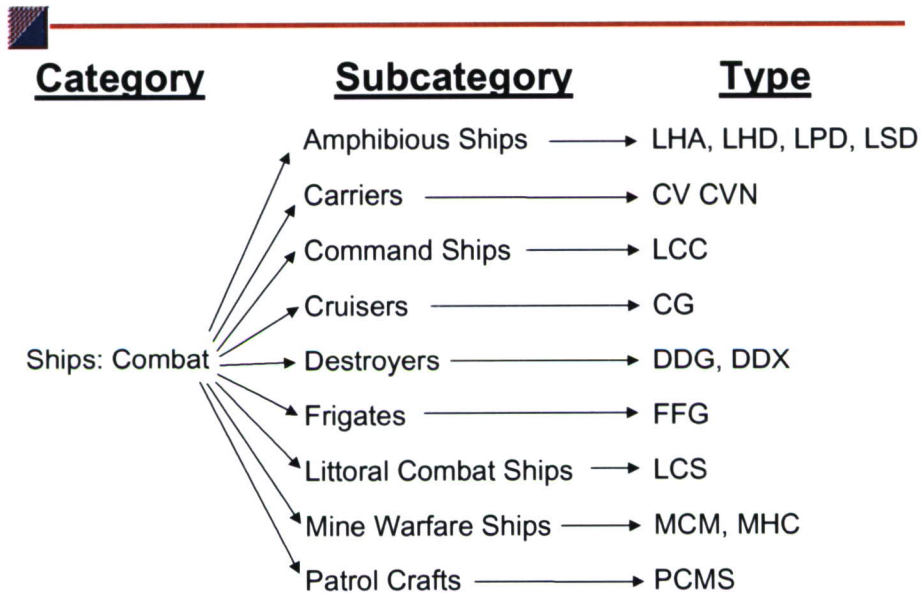
- Aviation Squadrons
- Communications
- Computer Support
- Construction Forces
- DoD Activities
- Expeditionary Forces
- Facility Engineering
- Fleet Command & Staff
- Headquarters
- Individuals Account
- Intelligence
- Investigation
- Joint Commands
- Legal
- Maintenance
- Marine Corps Support
- Medical
- Meteorology & Oceanography
- Military Sealift
- Ocean Surveillance
- Operational Bases
- Other
- Personnel
- Recruiting
- Reserve Activities
- Security Group Activities
- Ship: Combat
- Ships: Support
- SPEC WAR
- Submarines
- Supply
- Support - MISC
- Support Activities
- Support Services
- Technical Activities
- Training & Education
- US GOVT DEPT
- Unknown

The May 2006 version of TFMMS contained nearly 6,000 units and activities—that is, Unit Identification Codes (UICs). Searching through a listing of this size to find units and activities to define a scenario can be cumbersome. To make this task easier, we grouped all these units and activities into 38 categories (listed on this slide). We further divided many of the categories into subcategories and types (see next slide). Our high-level categorization includes the standard breakout of the operational forces into aviation squadrons, combat ships, support ships, submarines, and expeditionary forces.

Our grouping of shore-based activities was more ambitious because we tried to identify and group activities into key functional areas, such as training & education, recruiting, and maintenance. Unfortunately, no data fields in TFMMS directly map activities to such categories. Our only option was to do this grouping manually. In proceeding, we used several data fields (e.g., activity name, claimant, activity code, and manpower requirements plan code) and, in some cases, did research into an activity's function in assigning units and activities to these categories. Due to the large number of activities, however, and keeping in mind the objective of the tool, we spent most of our effort assigning units and activities with large manpower requirements. The assignment of smaller activities and those with cryptic names or missing data was more subjective.

Users of this tool should consider this categorization as no more than a starting position. Because such a grouping is useful in analyzing manpower requirements by functional area or capability, we believe that the Navy should task manpower claimants to review this categorization and make adjustment where needed.

## Category, Subcategory, Type



This slide shows an example of how we further divided some categories into subcategories and types. In this example, the category of *Ships: Combat* is divided into nine subcategories. We further divided four of these subcategories into more than one type. In our initial categorization, not all units and activities are assigned to a subcategory and type. We mostly applied this more detailed breakout to operating force units (i.e., ships, submarines, and aviation squadrons). The structure of the activity data table, however, does allow all shore-based activities to be assigned to subcategories and types as well.

# Calculating Manpower Requirements and Costs

Activity Category	Activity Sub-Category	Activity	SHORT NAME	AUTC	mlReq	chvReq
Ship: Combat	Cruisers	CG	CG 52 BUNKER HIL	21345	332	
Ship: Combat	Cruisers	CG	CG 53 MOBILE BAY	21346	320	
Ship: Combat	Cruisers	CG	CG 54 ANTIETAM	21387	320	
Ship: Combat	Cruisers	CG	CG 55 LEYTE GULF	21388	332	
Ship: Combat	Cruisers	CG	CG 56 SAN JACINT	21389	332	
Ship: Combat	Cruisers	CG	CG 57 LAKE CHAMP	21428	332	
Ship: Combat	Cruisers	CG	CG 58 PHILIP SEA	21429	336	
Ship: Combat	Cruisers	CG	CG 59 PRINCETON	21447	332	
Ship: Combat	Cruisers	CG	CG 60 NORMANDY	21449	332	
Ship: Combat	Cruisers	CG	CG 61 MONTEREY	21450	320	
Ship: Combat	Cruisers	CG	CG 62 CHANCELVIL	21451	337	
Ship: Combat	Cruisers	CG	CG 63 COWPENS	21623	336	
Ship: Combat	Cruisers	CG	CG 64 GETTYSBURG	21624	336	
Ship: Combat	Cruisers	CG	CG 65 CHOSIN	21625	336	
Ship: Combat	Cruisers	CG	CG 66 HUE CITY	21656	324	
Ship: Combat	Cruisers	CG	CG 67 SHILOH	21657	336	
Ship: Combat	Cruisers	CG	CG 68 ANZIO	21658	332	
Ship: Combat	Cruisers	CG	CG 69 ROCKSBURG	21659	336	

NAME
+9   CG 52 BUNKER HIL
+9   CG 53 MOBILE BAY
+9   CG 54 ANTIETAM
+9   CG 55 LEYTE GULF
+9   CG 56 SAN JACINT
+9   CG 57 LAKE CHAMP
+9   CG 58 PHILIP SEA
+9   CG 59 PRINCETON
+9   CG 60 NORMANDY
+9   CG 61 MONTEREY
+9   CG 62 CHANCELVIL
+9   CG 63 COWPENS
+9   CG 64 GETTYSBURG
+9   CG 65 CHOSIN

After the user defines a scenario, he/she selects the type of output to display in the “canned reports” and runs the scenario. The two output variable selections for the canned reports are (1) billet requirements or authorizations and (2) fiscal year (i.e., CFY, FY+1, ... FY+7).<sup>1</sup> Clicking the “Run Scenario” button will first prompt the user to save the scenario (as a list of selected UICs and scaling factors) to a text file. Once the file is saved, the tool extracts military and civilian billet data for the selected activities, applies the user-defined scaling factors and signs (“+” for additions and “-” for deletions), and calculates the net billet requirements and authorizations. It also calculates the costs of these manpower requirements and authorizations. For scenarios involving fractional scaling factors, the tool calculates fractional billet requirements. When displaying manpower results, however, the tool rounds billet requirements to the nearest integer. On one hand, because the tool works with manpower requirements at the rating/designator and paygrade levels and because the requirements at these levels for most activities are small, a 0.8 scaling factor will most likely not result in 20 percent fewer billets. Costs, on the other hand, are calculated using fractional billets; therefore, a 0.8 scaling factor will result in a 20-percent reduction in costs.

The tool stores manpower and cost results in a temporary file. This file is not saved as part of the scenario definition file, so the user must rerun the scenario when retrieving a previously saved scenario file.

1. CFY stands for current fiscal year, FY+1 represents the next fiscal year, and FY+7 is the last year of the FYDP).

# Output

## ➤ Measures:

- Billets: requirements and authorizations
- Costs: program and composite rates

## ➤ Groupings/descriptors:

- Appropriation: MPN, RPN, Civ
- Type: Off, Enl, WO, Civ
- Category: Active, FTS, SELRES, Civ
- Rating/designator and paygrade
- Management community
- Enterprise
- IGCA categories

	Billets Authorized			
	Enlisted	Officer	Warrant Officer	Civilian
Active	10,000	300	-50	
FTS	780	50	-3	
SELRES	450	25	-5	
Civilian				420
Total	11,130	375	-58	420

	Program Rates	Composite Rates
Active	\$12,545K	\$13,200K
FTS	\$1,050K	\$950K
SELRES	\$356K	\$356K
Civilian	\$2,500K	\$2,450K
Total	\$16,451K	\$16,956K

The Billet Analysis Tool computes two basic output measures: manpower requirements and the costs of these requirements. Manpower requirements are expressed in terms of billet requirements (i.e., what's required to perform the mission according to the ship, aviation, and shore manning documents) and billet authorizations (i.e., billets that have been funded). The tool computes two sets of costs: one based on manpower programming rates and one on manpower composite rates. Costs are calculated for both billet requirements and billet authorizations.

The tool provides the capability to group and display these measures at several levels of detail and by many descriptors. High-level groupings include those by appropriation category (active, reserve, and civilian), by manpower category (active duty, full-time support, Selected Reserve, and civilian), and by manpower type (enlisted, officer, warrant officer, and civilian). More detailed level breakouts include those by rating, paygrade, management community, and NEC for enlisted requirements and by designator and paygrade for officer requirements. Community managers can use these detailed breakouts to see if manpower changes adversely affect the paygrade structure of their communities. The tool can also display manpower requirements and costs by Enterprise and IGCA categories.

## Displaying Results

- Report builder
  - Select data fields
  - Select grouping
  - Total Navy or scenario results
  - Data sheet format
  - Easily copied into Excel
- Canned report options
  - Enterprise report
  - Manpower type
  - Manpower category
  - All levels
  - Total billets x FY



The Billet Analysis Tool provides two options for viewing results. Users can select from a list of so-called canned reports in the *Run Excursion* module or they can create customized output tables in the *Flexible Report* module.

To create a table in the *Flexible Report* module, the user first selects the type of output: requirements or authorizations. Next, he/she selects whether to display results for the active scenario (by checking the Filter UICs box) or the entire Navy (by leaving the box unchecked). The user then builds the output table by selecting data fields. There are two types of fields: data descriptors and output measures. Data descriptors determine how to group and display the output measures. Output measures are manpower requirements or costs for a specified fiscal year. If the user selects more than one data descriptor field, the order of the selection determines the grouping hierarchy. For example, selecting rating, manpower type, and CFY in that order will produce a table that contains manpower requirements for the current fiscal year grouped first by rating and then, within each rating, by manpower type.

Canned report are formatted Microsoft Access reports. Options include manpower requirements and costs by manpower type, manpower category, all levels, and totals by fiscal year.

## Additional Features

### ➤ *All Navy Summaries*

- Displays manpower requirements and costs for entire Navy
- Option to include manpower for future platforms

### ➤ *Community Management*

- Displays manpower requirements by selected ratings and designators
- Displays NEC requirements

The Billet Analysis Tool provides additional data display capabilities through the *All Navy Summaries* and *Community Management* modules. The *All Navy Summaries* module offers a quick way to display manpower requirements and costs for the entire Navy for each fiscal year across the FYDP. These requirements can serve as a baseline when analyzing the manpower effects due to force structure changes. Available reports include all billets authorized, all billet requirements, all billets authorized by paygrade, and total costs based on program and composite manpower cost rates. Users can also select whether to include manpower requirements for future platforms that were added to the tool's data tables or to display only the requirements in TFMMS.

The *Community Management* module provides the capability to quickly display all Navy requirements for individual enlisted ratings and officer designators. The user selects one or more ratings and designators from a pull-down menu and then chooses the type of output to display. Report options include billet requirements and authorizations by paygrade or by UIC, manpower costs, and NEC requirements.

## Data Sources: TFMMS



- Military billets
  - Requirements and authorized billets for CY and FY1 - FY7
  - Active duty, full-time support, and SELRES
  - Enlisted, Officer, Warrant Officer
  - Rating/designator and paygrade
- Activity file
  - UIC
  - Activity name
  - Category (ships, subs, squadrons, etc.)
- Civilian billets
  - TFMMS extract provided by N124
  - Reviewed by manpower claimants
  - Reflects current authorizations (Req. = BA)

TFMMS is the authoritative source for Navy manpower data. It contains total force manpower requirements and authorizations (funded billets) for all Navy activities (operating units, shore-based activities, and manpower accounts) identified by UIC. It gives the requirements for the current fiscal year and for each year in the FYDP. OPNAV Instruction 1000.16J defines an activity as a unit, organization, or installation performing a specific function and established under a commanding officer, officer in charge, and so on. The UIC is a five-position numeric/alphanumeric code assigned by DFAC to ships, aircraft, units, shore activities, and their divisions, commands, bureaus/offices, contractors' plants, and sometimes to functions or specialized elements for identification.

We extracted military billet data directly from TFMMS to populate the BAT data tables. CNA receives a monthly download of a billet data file and an activity data file. For each billet requirement, we extract the enlisted rating, officer designation, paygrade, appropriation category, IGCA reason and function codes, primary and secondary NEC requirements, enlisted management community, and the requirement (1 or 0) for each of the seven FYs. The activity file contains all activities (DOD and government) that have Navy manpower requirements. Data fields include activity name, location (city, state, and geolocation code), claimant, sea/shore duty code, and activity code.

The civilian manpower data in TFMMS have quality issues, so civilian data in BAT come from an N124 database. (The data originate from TFMMS but go to manpower claimants for verification.) N124 compiles the responses and updates the database. The result is a more accurate representation of the civilian workforce. Because N124 is concerned only with *funded* civilian billets, the civilian data reflect billet authorizations but not requirements. Accordingly, we set civilian requirements equal to authorizations. The civilian data are updated yearly; we update the military data monthly.<sup>1</sup>

1. We update the civilian data to some degree during the monthly update process by allowing only civilian billets at UICs that are in the monthly TFMMS activity file. Thus, the data should reflect situations where a unit or activity was recently disestablished and the civilian billets eliminated.

## Rules for Extracting Military Billet Data from TFMMS

- For billets in Additional Duty status, only include records that are “Additional Duty To”
  - Accounting Category (AC)  $\neq$  N
- Select records where Peacetime Requirement (PR) Code equals 1 or 2
  - Peacetime and mobilization (1)
  - Peacetime only (2)
- Collapse over “effective date” field
- Sum requirements for same rating/designator and paygrade within an activity

In extracting military billet data from TFMMS, we established the following rules. First, to prevent double counting billet authorizations in “Additional Duty” status, we included only “Additional Duty To” authorizations (i.e., billets with the Accounting Category Code not equal to “N”). Based on discussions with the sponsor, we selected only billets that are required in either peacetime and mobilization or just in peacetime (i.e., Peacetime Requirement (PR) code = 1 or 2). We did not include billets that are required only under mobilization.

We also performed some data processing procedures to reduce the size of the billet data set. For example, TFMMS can contain multiple records for a billet if some aspect of the requirement changes over time. Two “effective date” fields define the time frame when each record is valid. Where possible, we consolidated the information into fewer records and eliminated the effective data field. We also consolidated identical requirements at an activity into a single record. For example, if an activity required three machinist mates of the same paygrade, we consolidated this information in one record with a requirement of three billets. TFMMS contains a separate record for each billet requirement.

## Allocating Billets to Manpower Categories

Manpower Category	TFMMS Fields		
	Appropriation Category	Manpower Resource Code	Manpower Type
Active Duty	MPN	AD, MD, ST, TR	E, O
Reserve Active	RPN	RT, TT, RP, RR	E, O
Reserve Inactive	RPN	RA	E, O
Civilian	OMN		C
Unknown	Blank		E, O, Blank

### MRC Definitions

- AD - Active Duty
- MD - Midshipmen
- ST - Student
- TR - Trainee
- RT - Training & Administration of Reserves (TAR)
- TT - TAR Trainee
- RP - 265 RPN (SELRES on AD not to exceed a 4-yr period)
- RR - Reserve Recruiter
- RA - Selected Reserve

One option to group and display billets is by manpower category. Navy billets fall into one of four categories: active duty, reserve active (or full-time support (FTS)), reserve inactive (or Selected Reserve (SELRES)), and civilian. This slide shows the data fields in TFMMS and the rules we used to map billet requirements to these categories. Appropriation Category represents the funding source. Manpower Resource Code (MRC) identifies the type of resources to fill each billet. MRC definitions are shown in the slide. Manpower Type identifies a billet as officer, enlisted, or civilian. We created a fifth category, Unknown, to account for military requirements that could not be mapped due to missing or incomplete data.

## Data Sources: Manpower Costs



- Programming rates\*
  - Enlisted
  - Officer
  - Warrant officer
  - SELRES
  - Average Civilian (GS-7 Step 5 + 29%)
- Composite rates (by paygrade)\*
  - Enlisted
  - Officer
  - Warrant officer
  - Civilian (GS Step 5 payscale + 29%)

\* Programming and composite rates for military from N1 POM guidance

The manpower cost rates in the Billet Analysis Tool come from several sources. For military billets, we used the cost rates provided in the POM-08 fiscal guidance memo issued by N1 in February of this year.<sup>1</sup> This memo contained officer and enlisted PB-07 manpower programming rates for active duty, FTS, and SELRES and PB-07 manpower composite rates for active duty and FTS. Because composite rates for SELRES personnel were not included, we estimated these rates using SELRES programming rates and the relationship between paygrade and composite rates for active duty personnel.

Cost rates for government civilian personnel vary by pay plan. The civilian manpower data set contains billet requirements in 46 pay plans. Many of these plans are specific to an occupation and location. To simplify the data requirements, and because nearly 60 percent of the civilian billet requirements fall under the General Schedule pay plan, we derived the civilian cost rates in BAT from the General Schedule (GS) pay tables. For a civilian programming rate, we used the salary for GS-7 Step 5 plus 29 percent to account for the costs of benefits and entitlements that are included in the military rates. We used the Step 5 payscale by grade (increased by 29 percent) for the composite rates.

1. Ser N1/NT/013 dated 2 Feb 06, Subj: N1/NT POM-08 Fiscal Guidance and Supplementary Information (Serial 3).

## Manning for Future Platforms



- Incorporate manpower requirements for future platforms/units not in TFMMS
  - DDX
  - CVN-21
  - Others
- Can define requirements at several levels
  - By rating/designator and paygrade (DDX)
  - Totals for enlisted and officer, average PG (CVN-21)
- Option to include or exclude these requirements when viewing total Navy requirement

One of the capabilities that the sponsor requested was to include manpower requirements for future platforms that are not yet in TFMMS (scheduled IOC is beyond the FYDP). To accommodate this request, we created a table that contains manning requirements for future platforms. The table structure is set up to define these requirements at the rating/designator and paygrade levels. If rating/paygrade information is not available, requirements can be defined at the more aggregate level of enlisted, officer, warrant officer, and civilian. To differentiate these “added” requirements from those in TFMMS, we assign a pseudo-UIC that begins with the underscore character. These new units get added to the activity listing so users can select them when defining scenarios. The all-Navy summary report provides the option to include or exclude these units when looking at the Navy’s total manpower requirements. As of June 2006, we include manning requirements for the future DDX platform (at the rating/designator and paygrade levels) and for the future CVN-21 platform (at the enlisted, officer, warrant officer level) based on preliminary manning documents provided by N12.

## Using the Billet Analysis Tool: Example 1

Task: Determine manpower effects of replacing 5 DDGs with 3 DDXs.

Scenario

1. Force structure change only

BAT Input

Scenario (Force Structure Units)
+3   DDX
-1   DDG 52 BARRY
-1   DDG 54 C WILBUR
-1   DDG 56 JS MCCAIN
-1   DDG 57 MITSCHER
-1   DDG 59 RUSSELL

BAT Output

Manpower Type	Billets Authorized	Manpower Costs
Enlisted	-1,244	-\$72,764,048
Officer	-105	-\$12,683,160
Warrant	-10	-\$1,207,920
Total	-1,359	-\$86,655,128

Scenario

2. Include 15% manpower reduction at Norfolk Regional Maintenance Center

BAT Input

Scenario (with Norfolk maintenance activity)
-15   MARMC
+3   DDX
-1   DDG 52 BARRY
-1   DDG 54 C WILBUR
-1   DDG 56 JS MCCAIN
-1   DDG 57 MITSCHER
-1   DDG 59 RUSSELL

BAT Output

Manpower Type	Billets Authorized	Manpower Costs
Enlisted	-1,381	-\$80,774,527
Officer	-110	-\$13,299,199
Warrant	-11	-\$1,316,633
Civilians	-183	-\$10,337,459
Total	-1,685	-\$105,727,818

This slide shows a simple example of how the Billet Analysis Tool can be used to determine the manpower effects of a force structure change. In this example, the task was to determine the effects of replacing five guided missile destroyers of the Arleigh Burke Class (DDG-51) with three destroyers of the next generation DD(X) destroyer program. We used the tool to examine two slightly different versions of this scenario. The first looked solely at the effects of force structure changes. The second expanded on this by including potential effects on the shore infrastructure, in this case reducing the manpower requirements at the Norfolk Regional Maintenance Center by 15 percent.<sup>1</sup>

The slide shows the tool input (scenario activities) and output (manpower requirements and costs) for both scenarios. The output shows that the force structure change would result in a decrease of 1,369 billets and reduction in costs of over \$86 million (based on FY+2 programming cost rates). Reducing the manning at the maintenance center further reduces manpower requirements by 326 billets (143 military and 183 civilian) and costs by over \$19 million.

1. The tool does not determine where or by how much manpower requirements at shore support activities should change. It does, however, compute the effects of user-defined changes (percentage increase or decrease) to manpower requirements at shore activities.

## Using the Billet Analysis Tool: Example 2

**Task: Determine yearly manpower requirements and costs to support the carrier fleet across FYDP**

- Scenario:
  - 2 CVs
  - 11 CVNs
  - 8 CVN dets
- Results:
  - Billets authorized
  - Costs

Scenario		
+1   CV 63 KITTY HAWK	+1   CVN 72 LINCOLN	+1   CVN NE DET B
+1   CV 67 JF KENNEDY	+1   CVN 73 GEO WASH	+1   CVN NW DET A
+1   CVN 65 ENTERPRIS	+1   CVN 74 J STENNIS	+1   CVN NW DET B
+1   CVN 68 NIMITZ	+1   CVN 75 H TRUMAN	+1   CVN SE DET A
+1   CVN 69 EISENHOWE	+1   CVN-76 REAGAN	+1   CVN SE DET B
+1   CVN 70 VINSON	+1   CVN 77 GEO BUSH	+1   CVN SW DET A
+1   CVN 71 T ROOSEVE	+1   CVN NE DET A	+1   CVN SW DET B

Manpower Category	Manpower Type	Billets Authorized							
		CFY	FY+1	FY+2	FY+3	FY+4	FY+5	FY+6	FY+7
MPN	Enlisted	35,862	33,541	32,581	32,691	32,344	32,344	32,344	32,344
MPN	Officer	1,751	1,652	1,615	1,575	1,575	1,575	1,575	1,575
MPN	Warrants	218	212	212	201	201	201	201	201
SELRES	Enlisted	544	544	544	544	544	544	544	544
SELRES	Officer	44	40	40	40	40	40	40	40
Total		38,419	35,989	34,992	35,051	34,704	34,704	34,704	34,704

Authorization Category	Manpower Costs (Programming Rates)							
	CFY	FY+1	FY+2	FY+3	FY+4	FY+5	FY+6	FY+7
MPN	\$2,225,716,901	\$2,127,996,717	\$2,126,414,836	\$2,199,452,988	\$2,260,306,552	\$2,323,601,104	\$2,382,204,984	\$2,453,636,144
RPN	\$6,016,196	\$6,058,352	\$6,226,376	\$6,337,928	\$6,473,592	\$6,525,800	\$6,578,752	\$6,631,864
Total	\$2,231,733,097	\$2,134,055,069	\$2,132,641,212	\$2,205,790,916	\$2,266,780,144	\$2,330,126,904	\$2,388,783,736	\$2,460,268,008

This slide shows another example of the tool's utility. In this case, the task was to determine the yearly manpower requirements and costs to support the Navy's aircraft carrier fleet across the FYDP. We defined the scenario, which included two CVs, 11 CVNs, and 8 CVN detachments, as shown in the scenario table. We used the *Flexible Report* module to generate two output tables. The first shows manpower requirements (in terms of billets authorized) grouped by manpower category and type. The second shows the costs of these requirements (based on programming rates) by appropriation category.

## The Road Ahead



- Navy contracted with Whitney, Bradley & Brown to manage the tool
  - Monthly updates
  - Solicit inputs from users
  - User guide
- CNA will start a follow-on study to incorporate relationships between force structure and manning at areas of the shore infrastructure
  - Eventually add this capability to BAT

The Navy has contracted with Whitney, Bradley & Brown, Inc., to manage the Billet Analysis Tool. As manager, the company will be responsible for conducting the monthly data updates from TFMMS. In addition, as more people use the tool, Whitney, Bradley & Brown will solicit feedback and, if needed, make modifications or add features to improve the tool's usefulness and ability to support a wider range of issues. The company is responsible for producing a user guide.

CNA will conduct a follow-on study that will examine relationships of the size, composition, and laydown of the force structure and the manpower requirements within certain areas of the shore infrastructure. The ultimate goal is to quantify these relationships and incorporate them into the Billet Analysis Tool, thereby providing a more robust determination of the manpower effects of force structure changes.

This page intentionally left blank

Approved for distribution:

September 2006

*Henry S. Griffis*

Henry S. Griffis, Director  
Workforce, Education and Training Team  
Resource Analysis Division

CNA's annotated briefings are either condensed presentations of the results of formal CNA studies that have been further documented elsewhere or stand-alone presentations of research reviewed and endorsed by CNA. These briefings represent the best opinion of CNA at the time of issue. They do not necessarily represent the opinion of the Department of the Navy.

Approved for Public Release; Distribution Unlimited. Specific authority: N00014-05-D-0500.  
Copies of this document can be obtained from the Defense Technical Information Center at [www.dtic.mil](http://www.dtic.mil) or from the CNA Document Control and Distribution Section by calling (703) 824-2123.

Copyright © 2006 The CNA Corporation